

Removal of Living Snails from their Shells by a Hermit Crab¹

BY

JAMES C. RUTHERFORD

Department of Zoology, University of California, Berkeley, California
and University of California Bodega Marine Laboratory, Bodega Bay, California²

EMPTY GASTROPOD SHELLS have been shown to be a limiting resource in the growth of hermit crab populations (VANCE, 1972). It has been assumed that hermit crabs do not kill snails to obtain their shells (MACGINITIE & MACGINITIE, 1968: 294), although several authors report hermit crabs removing living snails from their shells (PURTYMUN, 1971; BRIGHTWELL, 1951, 1953). Thus it is assumed by hermit crab workers that the shell pool available to hermit crabs is a function of the population sizes and mortality rates of the snail populations. However, my observations on a specimen of *Paguristes turgidus* (Stimpson, 1857) suggest that hermit crabs may actively appropriate shells from living snails.

On March 25, 1975 a *Paguristes turgidus* with a shield length of 12 mm, occupying a *Polinices* shell, was placed in a 360 l capacity tank with 2 living *Busycotypus canaliculatus* (Linnaeus, 1758) and a living *Neptunea lirata* (Gmelin, 1791). The *Polinices* shell occupied by the hermit crab was large enough that the hermit crab could retreat completely out of sight into the shell. Thus the shell was more than adequate in size. On March 28 the *Paguristes* was observed with the aperture of its shell apposed to the aperture of the *Neptunea* shell. The crab and snail remained together for 2 days at which time I removed the crab to see what it was doing. The *Neptunea* had retreated so far into its shell that no soft parts of its body were visible, and the operculum tightly sealed the entrance. This suggests that the snail had been greatly irritated, as it took much poking to get the snail to close up so tightly (personal observation). The snail and hermit crab were placed back into the tank and the next day the crab was apposed in the same manner with one of the *Busycotypus*. Two days later, on April 2, the fresh body of the *Busycotypus* was found in the tank and the hermit crab was occupying the *Busycotypus* shell. The snail was alive before the crab started work on it and the

freshness of the body indicated that the crab actively removed the snail from its shell. No part of the snail was eaten by the crab. The snail shell had an aperture width of 40 mm and a shell length, excluding the siphon, of 102 mm.

After occupying the *Busycotypus* shell for 6 weeks the *Paguristes* removed the other living *Busycotypus* from its shell. From May 14 to 17 the hermit crab pulled on the siphon and foot of the snail and poked up into the visceral mass of the snail with its legs. Finally, on May 17 the crab crawled into the space between the visceral mass and the shell and occupied the snail shell with the recently killed snail still well attached to the shell. Again there were no signs that the crab had eaten any part of the snail. The second snail killed by the crab had an aperture width of 47 mm and a shell length, excluding the siphon, of 113 mm.

From these observations I conclude that the crab was only interested in the snail for its shell and not as a food source. Of course, the conditions were somewhat artificial in that *Paguristes* is a subtidal hermit crab ranging from Alaska to San Diego (McLAUGHLIN, 1974) and is not found in San Francisco Bay (SCHMITT, 1921). Thus it would not encounter *Busycotypus* which is only found in San Francisco Bay as a result of introduction from the East Coast of North America. However, *Paguristes* does encounter *Neptunea* in the northern half of its range and although it did not succeed in removing the *Neptunea* from its shell, it might have, had it not been disturbed. Also, the *Busycotypus* may have been sick. BRIGHTWELL (1951, 1953) found that *Eupagurus bernhardus* was incapable of ousting healthy *Buccinum* but readily removed sickly specimens from their shells.

Behavior similar to that reported above for *Paguristes turgidus* has been reported in other hermit crabs. PURTYMUN (1971) reported on the hermit crab *Aniculus strigatus* killing *Conus pennaceus*, eating the animal and then occupying the shell. MAGALHAES (1948) observed hermit crabs attacking living *Busycon* at Beaufort, North Carolina. THOMPSON (1903) observed hermit crabs occupy-

¹ Contribution No. 4 of the Bodega Marine Sciences Association

² Present address: Biology Department, Hilo College, Box 1357, Hilo, Hawaii 96720

ing snail shells with the dead snail still in the shell and BRATCHER (1971) found a *Pagurus* in a living *Polinices altus*.

Thus, active predation of hermit crabs on snails to obtain their shells could be a more common phenomenon than previously thought and could be an important source of new shells for hermit crab populations.

ACKNOWLEDGMENTS

I would like to thank Dr. Cadet Hand for use of the facilities of Bodega Marine Laboratory, and Mr. James Carlton for discussion of the manuscript.

Literature Cited

BRATCHER, TWILA

1971. Conchological housing shortage or all about a pushy hermit crab. *Hawaiian Shell News* 19 (1): 9 (N. S. no. 133)

BRIGHTWELL, L. R.

1951. Some experiments with the common hermit crab (*Eupagurus bernhardus* Linn.), and transparent univalve shells. *Proc. Zool. Soc. London* 121: 279-283

1953. Further notes on the hermit crab *Eupagurus bernhardus* and associated animals. *Proc. Zool. Soc. London* 123: 61-64

MACGINITIE, GEORGE EBER & NETTIE MACGINITIE

1968. *Natural history of marine animals*. 2nd ed. i-xii+523 pp. McGraw-Hill Book Co., New York, N. Y.

MAOALHAES, HULDA

1948. An ecological study of snails of the genus *Busycon* at Beaufort, North Carolina. *Ecolog. Monogr.* 18: 377-409

McLAUGHLIN, PATSY A.

1974. The hermit crabs (Crustacea Decapoda, Paguridae) of north-western North America. *Zool. Verhandl.* no. 130: 1-396; 101 text figs.; 1 map; 1 plt.

PURTYMUN, B.

1971. Predatism. *Hawaiian Shell News* 19 (5): 4 (N. S. no. 137)

SCHMITT, WALDO L.

1921. The marine decapod Crustacea of California, with special reference to the decapod Crustacea collected by the United States Bureau of Fisheries Steamer "Albatross" in connection with the biological survey of San Francisco Bay during the years 1912-1913. *Univ. Calif. Publ. Zool.* 23: 470 pp.; 50 pls.; 165 text figs. (21 May 1921)

THOMPSON, M. T.

1903. The metamorphosis of the hermit crab. *Proc. Boston Soc. Nat. Hist.* 31: 147-210

VANCE, RICHARD R.

1972. Competition and mechanism of coexistence in three sympatric species of intertidal hermit crabs. *Ecology* 53 (6): 1062-1074; 12 text figs.

